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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER				
RUTZ, JARED IAN				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/702,137

Applicant(s)

STEINMETZ ET AL.

Examiner

JARED I. RUTZ

Art Unit

2187

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7-12, 19 and 20 is/are allowed.
- 6) ☒ Claim(s) 1-6, and 13-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI/08)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

1. Claims 1-20, as amended on 6/14/2007, are pending in the instant application. Applicant's arguments presented in the Appeal Brief submitted 10/14/2008 have been carefully and fully considered, and are found persuasive. Accordingly, the grounds of rejection presented in the Office action of 8/22/2007 have been withdrawn. The instant Office action contains new grounds of rejection, not necessitated by amendment.

Reopening of Prosecution After Appeal Brief or Reply Brief

2. In view of the appeal brief filed on 10/14/2008, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1, 2, 4-6, 13, 14, and 16-18** rejected under 35 U.S.C. 103(a) as being unpatentable over Reger et al. (US 7,127,798) in view of Still (US 6,191,712).

Claim 1 is taught by Reger as:

A virtual disk formatting system comprising: a plurality of mass-storage devices, each having physical sectors of a first sector length. Figure 7 shows a diagram of a file server constructed from a disk drive shelf, and shows a plurality of disks 23. Although Reger does not expressly teach that the disks have physical sectors, it is well known in the art for drives to be divided into physical sectors.

And a routing component that provides a virtual disk interface to the mass-storage devices by routing each access operation, received from an external entity, each access operation directed to a virtual disk having virtual sectors of a second sector length, to one or more mass-storage devices of the plurality of mass-storage devices, having physical sectors of the first sector length. Figure 7 shows the disk shelf includes head 64. Column 5 lines 30-33 shows that the head includes I/O connections to allow the shelf to be used as a NAS file server and/or a SAN storage system, teaching receiving access operations from external entities. Column 4 lines 3-7 shows that a

head can implement RAID groups, teaching the presentation of a virtual disk. Column 4 lines 9-26 shows that I/O module 31, shown at column 7 lines 9-12 to be replaced by a single-board head 64, provides loop resiliency, which may be performed by switching, teaching routing access operations.

Reger does not expressly teach that the virtual disk presented as a RAID group has virtual sectors of a second sector length, wherein the first sector length and the second sector length refer to data- payload lengths of physical sectors.

With respect to claim 1, Still teaches a circuit for managing the conversion of data between a logical sector format and a physical sector format. Figure 3B shows an example where each logical sector is 2054 bytes, and each physical sector is 514 bytes.

Reger and Still are analogous art because they are from the same field of endeavor, disk storage systems.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to allow the single-board head of Reger to implement the conversion circuit of Still.

The motivation for doing so, from Still column 1 lines 23-35 show that when a processor needs to access data, it most likely does not need to operate on an integer multiple of a physical sector's worth of data. Further rationale for combining the logical to physical conversion of Still to the storage shelf file server of Reger would have been applying a known technique (the conversion of data between a logical sector format and a physical sector format) to a known device (the storage shelf file server of Reger), to obtain predictable results.

Therefore, it would have been obvious to combine Reger and Still to obtain the invention as specified in **claims 1, 2, and 4-6**.

Claim 2 is taught by Reger as:

The virtual disk formatting system of claim 1 wherein the routing component is an integrated-circuit storage-shelf router. Column 3 lines 23-30 shows that head 64 is inserted in a storage shelf.

Claim 4 is taught by Reger and Still as:

The virtual disk formatting system of claim 1 wherein the routing component includes a processor and firmware/software programs that carry out virtual disk formatting. Reger column 6 lines 53-61 shows that head 64 contains a processor and DRAM, and that the processor controls the operation of the head. Still column 3 lines 21-28 shows that padding logical sectors can be performed in software.

Claim 5 is taught by Still as:

The virtual disk formatting system of claim 1 wherein virtual sectors are mapped onto contiguous physical sectors. Figure 3B shows logical sectors 1, 2, and 3 are mapped to consecutive physical sectors 1-12.

With respect to the following formulas, the Examiner respectfully notes that claim 5 as currently recited does not require the calculations to be performed, but merely requires allowing such a calculation to be performed. As the combination of Reger and

Still does not appear to do anything to prevent such a calculation from being performed, it is considered to allow the following formulas to be calculated.

allowing the physical sector and byte address of the first byte of a virtual sector to be calculated, when the second sector length is greater than the first sector length, as:

$fsl = \text{first sector length}$

$ssl = \text{second sector length}$

$\text{modulus} = (\text{smallest number evenly divisible by both } fsl \text{ and } ssl) / ssl$

$\text{difference} = ssl - fsl$

$\text{physical sector} = \text{virtual sector} + (\text{virtual sector} / \text{modulus})$

$\text{physical byte address} = \text{remainder}(\text{virtual sector} / \text{modulus}) \times \text{difference}$

and, when the second sector length is less than the first sector the physical sector and byte address of the first byte of a virtual sector is calculated, as:

$fsl = \text{first sector length}$

$ssl = \text{second sector length}$

$\text{modulus} = (\text{smallest number evenly divisible by both } fsl \text{ and } ssl) / ssl$

$\text{difference} = fsl - ssl$

$\text{physical sector} = \text{virtual sector} - (\text{virtual sector} / \text{modulus})$

$\text{physical byte address} = \text{remainder}(fsl - \text{remainder}(\text{virtual sector} / \text{modulus}) \times \text{difference}) / fsl.$

Claim 6 is taught by the combination of Reger and Still as:

The virtual disk formatting system of claim 5 wherein, when the modulus and difference are both evenly divided by 2, the division and multiplication operations can be replaced with shift operations, and the remainder operation can be replaced by a bit-wise and operation. The Examiner again notes that claim 6 does not require that the division and multiplication be performed by shift operations, or that the remainder is performed by a bitwise AND. The Examiner additionally notes that these are known mathematical facts for binary arithmetic.

Claim 13 is taught by Reger as:

A method for providing a virtual-disk-format interface to processing entities external to a number plurality of mass storage devices, each having physical sectors of a first sector length. Figure 7 shows a diagram of a file server constructed from a disk drive shelf, and shows a plurality of disks 23. Although Reger does not expressly teach that the disks have physical sectors, it is well known in the art for drives to be divided into physical sectors.

The method comprising: providing a routing component; and routing each access operation, received from an external entity, each access operation directed to a virtual disk having virtual sectors of a second sector length by the routing component to one or more of the number plurality of mass-storage devices having physical sectors of the first sector length. Figure 7 shows the disk shelf includes head 64. Column 5 lines 30-33 shows that the head includes I/O connections to allow the shelf to be used as a NAS file server and/or a SAN storage system, teaching receiving access operations from

external entities. Column 4 lines 3-7 shows that a head can implement RAID groups, teaching the presentation of a virtual disk. Column 4 lines 9-26 shows that I/O module 31, shown at column 7 lines 9-12 to be replaced by a single-board head 64, provides loop resiliency, which may be performed by switching, teaching routing access operations.

Reger does not expressly teach that the virtual disk presented as a RAID group has virtual sectors of a second sector length, wherein the first sector length and the second sector length refer to data- payload lengths of physical sectors.

With respect to claim 13, Still teaches a circuit for managing the conversion of data between a logical sector format and a physical sector format. Figure 3B shows an example where each logical sector is 2054 bytes, and each physical sector is 514 bytes.

Reger and Still are analogous art because they are from the same field of endeavor, disk storage systems.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to allow the single-board head of Reger to implement the conversion circuit of Still.

The motivation for doing so, from Still column 1 lines 23-35 show that when a processor needs to access data, it most likely does not need to operate on an integer multiple of a physical sector's worth of data. Further rationale for combining the logical to physical conversion of Still to the storage shelf file server of Reger would have been applying a known technique (the conversion of data between a logical sector format and

a physical sector format) to a known device (the storage shelf file server of Reger), to obtain predictable results.

Therefore, it would have been obvious to combine Reger and Still to obtain the invention as specified in **claims 13, 14, and 16-18**.

Claim 14 is taught by Reger as:

The method of claim 13 wherein the routing component is an integrated-circuit storage-shelf router. Column 3 lines 23-30 shows that head 64 is inserted in a storage shelf.

Claim 16 is taught by Reger and Still as:

The method of claim 13 wherein the routing component includes a processor and firmware/software programs that carry out virtual disk formatting. Reger column 6 lines 53-61 shows that head 64 contains a processor and DRAM, and that the processor controls the operation of the head. Still column 3 lines 21-28 shows that padding logical sectors can be performed in software.

Claim 17 is taught by Still as:

The method of claim 13 further including: mapping, by the routing component, virtual sectors onto contiguous physical sectors. Figure 3B shows logical sectors 1, 2, and 3 are mapped to consecutive physical sectors 1-12.

With respect to the formulas recited in claim 17, the Examiner respectfully notes that claim 17 as currently recited does not require the calculations to be performed, but merely requires allowing such a calculation to be performed. As the combination of Reger and Still does not appear to do anything to prevent such a calculation from being performed, it is considered to allow the following formulas to be calculated.

Claim 18 is taught by the combination of Reger and Still as:

The method of claim 17 wherein, when the modulus and difference are both evenly divided by 2, the division and multiplication operations can be replaced with shift operations, and the remainder operation can be replaced by a bit-wise and operation.

The Examiner again notes that claim 6 does not require that the division and multiplication be performed by shift operations, or that the remainder is performed by a bitwise AND. The Examiner additionally notes that these are known mathematical facts for binary arithmetic.

5. **Claims 3 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Reger in view of Still as applied to claims 2 and 14 above, and further in view of Applicant's Admitted Prior Art.

Claim 3 is taught by Reger as:

The virtual disk formatting system of claim 2 wherein the storage-shelf router provides a fibre-channel-disk-based virtual disk formatting interface to external entities

and maps fibre-channel-disk-based access operations to a number of disk drives included in a storage shelf containing the storage-shelf router. Column 7 line 58 through column 8 line 7 shows that head 64 includes a fibre channel adapter to allow the storage shelf to be used as SAN storage.

Reger does not expressly teach that the drives within the storage shelf are ATA drives.

With respect to claim 3, AAPA shows, at page 21 lines 5-10, that the use of ATA drives was known at the time of the invention.

Reger, Still, and AAPA are analogous art because they are from the same field of endeavor, disk storage systems.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use ATA drives to implement disks 23.

The rationale for doing so would have been that ATA is one of a finite number of known standards for disk drives.

Accordingly, it would have been obvious to implement disks 23 of Reger with ATA disk drives to obtain the invention as specified in **claim 3**.

Claim 15 is taught by Reger as:

The method of claim 14 wherein the storage-shelf router provides a fibre-channel-disk-based virtual disk formatting interface to external processing entities and further including: routing, by the storage-shelf router, fibre-channel-disk-based access operations to a number of ATA disk drives included in a storage shelf containing the

storage-shelf router. Column 7 line 58 through column 8 line 7 shows that head 64 includes a fibre channel adapter to allow the storage shelf to be used as SAN storage.

Reger does not expressly teach that the drives within the storage shelf are ATA drives.

With respect to claim 15, AAPA shows, at page 21 lines 5-10, that the use of ATA drives was known at the time of the invention.

Reger, Still, and AAPA are analogous art because they are from the same field of endeavor, disk storage systems.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use ATA drives to implement disks 23.

The rationale for doing so would have been that ATA is one of a finite number of known standards for disk drives.

Accordingly, it would have been obvious to implement disks 23 of Reger with ATA disk drives to obtain the invention as specified in **claim 15**.

Allowable Subject Matter

6. **Claims 7-12 and 19-20** are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JARED I. RUTZ whose telephone number is (571)272-5535. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Ellis can be reached on (571)272-4205. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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